

From: [Erin Madden](#)
To: [Eric Blischke/R10/USEPA/US@EPA](#)
Cc: [Chip Humphrey/R10/USEPA/US@EPA](#)
Subject: Re: Information for the Lamprey Tox Testing Agenda Item
Date: 11/10/2006 08:30 AM

Eric,

Thank you for your attention to this matter and taking it so seriously. I am pleased that the lab will be running tests at different temps because I think that may provide us some good info as to how these critters metabolize chemicals and whether temperature makes a difference. The Nez Perce Tribe looks forward to participating the technical discussions to develop a study design that will most effectively produce data that is usable and helpful for the definitive testing in the Spring.

erin

On Nov 9, 2006, at 4:57 PM, Blischke.Eric@epamail.epa.gov wrote:

Jeff, your opposition is noted.

As you may be aware, this issue was further discussed at our management team meeting that took place yesterday afternoon following the TCT. Tribal representatives at the meeting included Erin Madden, Rose Longoria, Billy Barquin and Valerie Lee. During the meeting, we agreed to go ahead with the testing at 12 C. Further exploration of the potential effects of temperature will take place following the completion of the initial range finding testing at 12 C. We also agreed at the managers meeting that the study design needs to be developed for the range finding tests at the higher temperature and that the appropriate technical representatives need to discuss this issue early next week.

The primary rationale for performing the testing at 12 C is because that is the temperature at which the lamprey ammocoetes were collected and because the lamprey ammocoetes were being held successfully at the lab at that temperature. In addition, there were certain laboratory logistical concerns that also support running the testing at 12 C. From my perspective, it is important to keep the following points in mind:

1) The 12 C testing we are moving forward with is an initial rangefinding test. The purpose of this test is to develop the protocols

2)=A0 Additional rangefinding = testing with the flow through system will take = place as part of Phase 2.
3)=A0 The purpose of the LC50 = testing it understand the sensitivity of the lamprey ammocoetes relative to other aquatic = organisms; LC50s presented in the = literature were derived from toxicity testing across a range = of temperatures.
4)=A0 The question of the = temperature of the Willamette River is not a critical factor; we are not looking at Willamette = River exposures but relative sensitivity to a = range of toxicants selected based on mode of toxic action.
5)=A0 No information (i.e.,=A0 the science available in peer = reviewed journals) has been presented = that demonstrates that lamprey will be more
6)=A0 EPA and the LWG are committed to performing additional range = finding tests at a higher = temperature.=A0 This will = help answer the question of the effect of = temperature on relative sensitivity.=A0 EPA agrees that certain details need to be worked out regarding how = this evaluation will proceed.=A0 EPA believes that the 12 C = test will be valuable in designing this = study.

Eric

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Eric and = Chip,

After the TCT discussion this morning regarding = ammocoete range
finding
I want to = make it clear that the Confederated Tribes of Grand Ronde
objects to beginning the range finding tests in the = absence of a
complete experimental study = design and data quality objectives to
address = the appropriate water temperature for testing.=A0 I am not =
opposed
to running tests at different = temperatures but there needs to be an
analysis = of what temperatures may be appropriate before the tests are
run, not after the initial run is finished.=A0 The = Grand Ronde does not
agree to the use of 12 = degrees C as a starting point for the reasons
laid out by Chris Thompson of EI and I find it = disturbing that the
decision does not appear to = have been based on the science available
in
peer = reviewed journals.=A0 In addition ammocoetes in streams are =
routinely
exposed to varying temperatures = between night and day which would
indicate they = could adjust to different temperatures in the lab.=A0
Please
feel free to call contact me if you have any = questions.

Jeff

From: Chris Thompson [mailto:chris.thompson@EILTD.net]

Sent: Tuesday, November 07, 2006 = 3:07 PM
To: Blischke.Eric@epamail.epa.gov; jeremy_buck@fws.gov;
Goulet.Joe@epamail.epa.gov; Jennifer L Peterson;
Shephard.Burt@epamail.epa.gov; Robert.Neely@noaa.gov;
rgensemer@parametrix.com; = Ron.Gouguet@noaa.gov

Cc: Jeff Baker; cunninghame@gorge.net; Stephen = Kelly;
erin.madden@gmail.com; stanv@ctsi.nsn.us; tomd@ctsi.nsn.us;
wbarquin@hk-law.com; Audiehuber@ctuir.com; Patti = Howard; Valerie Lee;
Aron Borok
Subject: Information for the Lamprey Tox Testing = Agenda Item

Hi All,

On October 30, I sent you all an = e-mail regarding the question: =A0 = What is the most appropriate temperature = at which toxicity testing of lamprey ammocoetes = should be conducted in the lab? =A0 = I asked that this be placed on the agenda = for tomorrow = 92s TCT call; as a result, I thought I would share this email with you regarding the issue so = that we can have a more productive = discussion in the TCT. =A0 = Among other things, I have addressed the = issues raised in Helle = 92s email to Eric regarding the = appropriate temperature for toxicity testing = of lamprey.

The FSP for the lamprey toxicity testing states that = testing will be done at 12 =B0C (=B1 1 =B0C). =A0 My concern is that this = temperature is inappropriate, and that a warmer = temperature (16 =B0-17 =B0C) is more =A0 This is = based on a wealth of literature, basic principles of fish physiology, thermal conditions in the = Willamette River, and advice from a lamprey = expert, Mike Meeuwig (who did research on lamprey for USGS) who has a wealth of experience maintaining = ammocoetes in the lab. =A0 More specifically the basis = for my conclusion that the tests should be = conducted at 16 =B0-17 =B0C are as follows.

1. =A0 =A0 It makes sense to = consider toxicity at temperatures experienced in the environment where organisms are exposed to = contaminants, and at which their exposure will = be the greatest. =A0 Because = lamprey are = 93cold-blooded = 94 their = metabolic rate will be higher at 16 =B0-17 =B0C than at 12 =B0C, and they will physiologically process more = contaminant at the higher temperature. =A0 For this reason alone, it = makes sense to have toxicity testing at = 16 =B0-17 =B0C than at 12 =B0C.

2. =A0 =A0 Temperatures to which = lamprey are exposed in the lab should be lamprey in the Willamette River. =A0 Lamprey ammocoetes are = exposed to temperatures in the lower = Willamette River from May through October ranging = from a minimum of 15 =B0C to a maximum of =A0 nearly 22 =B0C, i.e., = much higher than 12 =B0C (see Figures = 1 and 2 below). =A0 Thus, a = temperature of 16-17 =B0C is far more = representative than is 12 =B0C of the temperature conditions in the Willamette River experienced by = ammocoetes during the months in which they are = active (i.e. not hibernating in the sediment).

3. =A0 =A0 One reason that one might = not want to test lamprey at the higher could adversely affect the = ammocoetes. =A0 However, = there is no indication

that lamprey held in the lab at 16-17-20°C are compromised in any way. When maintained in a clean laboratory medium, in the absence of contamination, lamprey ammocoetes survive equally well at 10-20°C, 14-20°C, and 18-20°C. This was the result of research by Michael Meeuwig on the tolerance of lamprey ammocoetes to exposure to different temperatures. See first paragraph of Mike's email below.

Figure 1: Monthly Average Temperature Longitudinal Profiles in the Willamette River Mile

Figure 1: Monthly Average Temperature Longitudinal Profiles in the Willamette River Mile

(Embedded image moved to file: pic08860.gif)

Figure 2: Temperature profiles in the middle of the Willamette River at Waverly Country Club, RM 17.9

The LWG's choice of 12°C as the temperature at which to conduct toxicity tests on ammocoetes was based on a rationale that is not technically sound. The LWG provided three reasons to EPA for why they selected 12°C in an October 27, 2006 email from Helle Andersen of Windward to Eric Blischke. More specifically the rationale presented in Helle's email and the errors in it are as follows.

1) Helle states, first, "The temperature in the holding aquaria was selected based on a conversation with Mike Meeuwig, previously employed by USGS, who indicated that temperature above 15°C may increase

As Mike Meeuwig's email to me states, his work shows no difference

in survivorship and other important factors of health when maintaining ammocoetes in the lab in a clean medium (clean water in the holding tank) within a temperature range of 10-20°C to 18-20°C.

Reduced survivorship at 16-17°C is not true and, thus, is not a reason for deviating from the logical selection of 16-17°C.

2) Second, Helle states: =93Another reason was that = rainbow trout testing is performed at 12=BAC. = Rainbow trout is in general regarded one of the most sensitive species, so performing the lamprey = ammocoete tests at the same temperature would = facilitate a comparison.=94

=A0 =A0 =A0 As we have discussed = at length, lamprey are dissimilar to trout.
=A0 =A0 =A0 Thus, the experience = with trout is largely irrelevant to the
=A0 =A0 =A0 appropriate = temperature at which to conduct toxicity tests on
=A0 =A0 =A0 = lamprey ammocoetes.=A0 = Moreover, results from a 12=B0C test are likely
=A0 =A0 =A0 = to understate toxicity of contaminants that ammocoetes = would
=A0 =A0 =A0 experience in the = Willamette.

3) Lastly Helle notes: =A0 =93Finally, the temperature = in Siletz River is currently around = 12=BAC.=94

=A0 =A0 =A0 = This fact is irrelevant to the selection of appropriate = toxicity
=A0 =A0 =A0 testing for = ammocoetes. As noted above, we should be striving to
=A0 =A0 =A0 = test a temperature that is experienced in the = Willamette.
=A0 =A0 =A0 Moreover, as noted = above, the metabolic rate will be higher at
16=B0
=A0 =A0 =A0 = -17=B0C than at 12=B0C and they physiologically process = more
=A0 =A0 =A0 contaminant at the = higher temperature. =A0 = Moreover, Mike Meeuwig
=A0 =A0 =A0 has explained to me = that there is no problem acclimating
=A0 =A0 =A0 ammocoetes collected = at 12=B0C to 16=B0-17=B0C. =A0 =
Further as the above
=A0 =A0 =A0 graphs demonstrate = temperatures to which ammocoetes are
subjected
=A0 =A0 =A0 = in the Willamette during the months of May-October are =
generally
=A0 =A0 =A0 significantly higher = than this.=A0 For example, = the average
=A0 =A0 =A0 temperature in July = is 21-22=B0C.

I encourage EPA to give careful consideration to = requiring that the LWG maintain and test = ammocoetes at a temperature of 16=B0-17=B0C.=A0 The upshot is that it makes little sense to spend precious = dollars on toxicity testing with a design that = is suboptimal.=A0 Moreover, = even if the LWG were to propose conducting tests = at two temperatures, we still have
=A0 In a budget = limited context, which we have here, the 12=B0C tests simply reduce the number of tests that could = be conducted at a far more appropriate = temperature.=A0 Hence it = makes little sense to conduct 12=B0C tests = at all.

I hope the foregoing information is helpful for the = discussion in the TCT meeting and we look forward = to talking about this at the meeting on

Chris

From: Meeuwig, Michael [mailto:mmeeuwig@montana.edu]
Sent: Monday, October 30, 2006 9:46 AM

To: Chris Thompson
Subject: = RE: lamprey ammocoete thermal preferences

Chris = Thompson;

Based on our data it seems that any temperature from = 10 to 18 degrees C should be adequate for = holding Pacific lampreys during your study. 14, and 18 were so small that = they likely do not indicate a substantial =A0 I must add = that our work was with early stage larvae so extrapolation to older life stages should be done = with caution.

We have held ammocoetes in the laboratory for = multiple years at seasonally variable temperatures = up to, and exceeding 15 C; these animals = appear to be fairly robust up to a point.

It seems to = me that if these toxicity tests are intended to be applicable to the Portland Harbor Superfund site = there really should be some basis for temperature = choice (e.g., temperatures experienced in the Portland Harbor Superfund site).=A0 I do not know a lot about = toxicology, but it seems that with = increasing temperature, and therefore metabolic rate, the rate of uptake of the toxins could change = and potentially have a significant affect on = your results.=A0 I realize = that the EPA often has standard protocols, but = perhaps since you are dealing with a) a species that may not have had these types of test done, and = b) you are applying the data to a specific = site, there may be a chance to institute a more comprehensive and rigorous study design.=A0 Is there any way you = could convince the Lower Willamette = Group to add a couple of treatments (e.g., tests at = minimum and maximum mean (or median) daily temperatures experienced in this area (also mid-point?) as well = as controls at these temperatures)?=A0 I understand this may not be = realistic in terms of funding, but it may not be = that realistic to stick with 12 C without any basis.

Bottom line, I would say that = there should not be any significant mortality = associated with acclimation and test temperatures between 10 to 18 degrees C based on the available literature = (i.e., survival should be high for control = animals), but that there may be unknown interactive, synergistic, or additive effects of temperature and = contaminants.

Sorry I could not give you a =93silver bullet=94 = temperature to use, but I really think = these types of things are more complicated than that so I will have to go with the available data.

Mike

Michael H. Meeuwig
MT = Cooperative Fishery Research Unit
Montana State = University - Ecology
PO Box 173460
Bozeman, MT 59717-3460
=A0 (406) = 994-3698

Chip and = Eric,

Thank you for your letter of = October 13, 2006 that provided comments to the = Round 3 Lamprey Ammocoete Toxicity Testing Field Sampling Plan. = LWG has reviewed all the comments = and is submitting the following response.

LWG = agrees that rigorous = 93 methods = 94 for the collection, transport, = and holding of the lamprey = ammocoetes will not be developed during Phase 1.

Instead useful information will be learned which = will be applied to the

Phase 2 toxicity testing. = As communicated by Chip last Friday, LWG

lamprey ammocoetes to be = collected for tissue chemistry analysis. The

field crew is therefore not collecting ammocoetes = for tissue analyses;

however, a sub-sample of = approximately 20 individual ammocoetes will be archived for future taxonomic identification if = necessary.

Additional notes on site = conditions are currently being taken by the

field = crew. The majority of the ammocoetes has been collected at a

specific site recommended by Stan Van De Wetering. = Water temperature in

the Siletz River during = collection has been above 12 = BAC and the number of

ammocoetes targeted for Phase 1 was met on 10/24/06. = The laboratory

(NAS) requested a total of 360 = individual ammocoetes to conduct the six

the field collection. However, = because a relatively large size range was

seen in = the ammocoetes and to ensure that enough ammocoetes were

collected to meet any future request from EPA and = its partners (i.e.,

archiving ammocoetes for = taxonomic identification) 800 ammocoetes were

collected in the field (the maximum number allowed = based on the

Scientific Taking Permit). This = will give NAS a better selection of

ammocoetes to = pick from at test initiations. The size and weight of a

subsample of ammocoetes have been measured at NAS. = The sizes ranged from

28 mm to 84 mm and from = 0.04 g to 0.78 g. Based on these measurements

and observation of the remaining ammocoetes NAS is = planning to use

ammocoetes in the middle of the = size range for the range-finding

LWG agrees that a key aspect of = the toxicity testing program is the

successful = holding of the lamprey ammocoetes. = A0 = NAS and Woodward have

therefore = contacted numerous scientists from USGS, USFW, ODFW, the

Siletz and others familiar with the holding of = lamprey ammocoetes. In

addition, members of NAS = went and talked with Christina Luzier, USFWS

biologist, in person to discuss her holding methods. = The lamprey

ammocoetes currently at NAS are = being closely monitored. Temperature,

weight and length measures was performed = 10/23/06. Mortality rate has

been very = low. Three ammocoetes out of 270 individuals have died in the

laboratory after about one week; two of these = arrived at the laboratory

in weak = condition. In general, NAS is reporting that the ammocoetes = look

very healthy. The hardness of = the water was selected for three reasons:

as EPA = pointed out in their letter, the water hardness in Willamette

River is soft, the water in the Siletz River is also = soft, and the

majority of the fish studies = used for deriving AWQCs was performed in

soft = water. Because only limited hardness data is available from = the

Siletz River, hardness has been = analyzed by NAS in water samples

collected by = the field crew at the ammocoete collection sites. The

holding and testing water is dechlorinated City of = Newport water with an

adjusted hardness of ≤ 50 mg/kg CaCO_3 and no problems have been observed during transition of the ammocoetes from site = collected water to holding. The temperature in the holding = aquaria was selected based on a conversation = with Mike Meeuwig, previously employed by USGS, who indicated that temperature above 15°C may increase = mortality. Another reason was that rainbow = trout testing is performed at 12°C . Rainbow trout is in general regarded one of the most = sensitive species, so performing the lamprey = ammocoete tests at the same temperature would facilitate a comparison. Finally, the temperature in = Siletz River is currently around 12°C . = However, LWG has initiated talks with NAS about performing one or two range-finding tests at two = different temperatures (12°C and 18°C) = (pending sufficient ammocoetes) in Phase 1. The transportation substrate (sterile sand) was = recommended by Stan Van De Wetering. = However, after talking with other fishery biologists including Christina Luzier, the substrate was changed to = site-collected sediment. LWG is = looking forward to continued communications with EPA and its partners about the lamprey ammocoetes toxicity = testing.

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